

Greenhouse Construction

Location

Orientation

Architectural structures

Roofing materials

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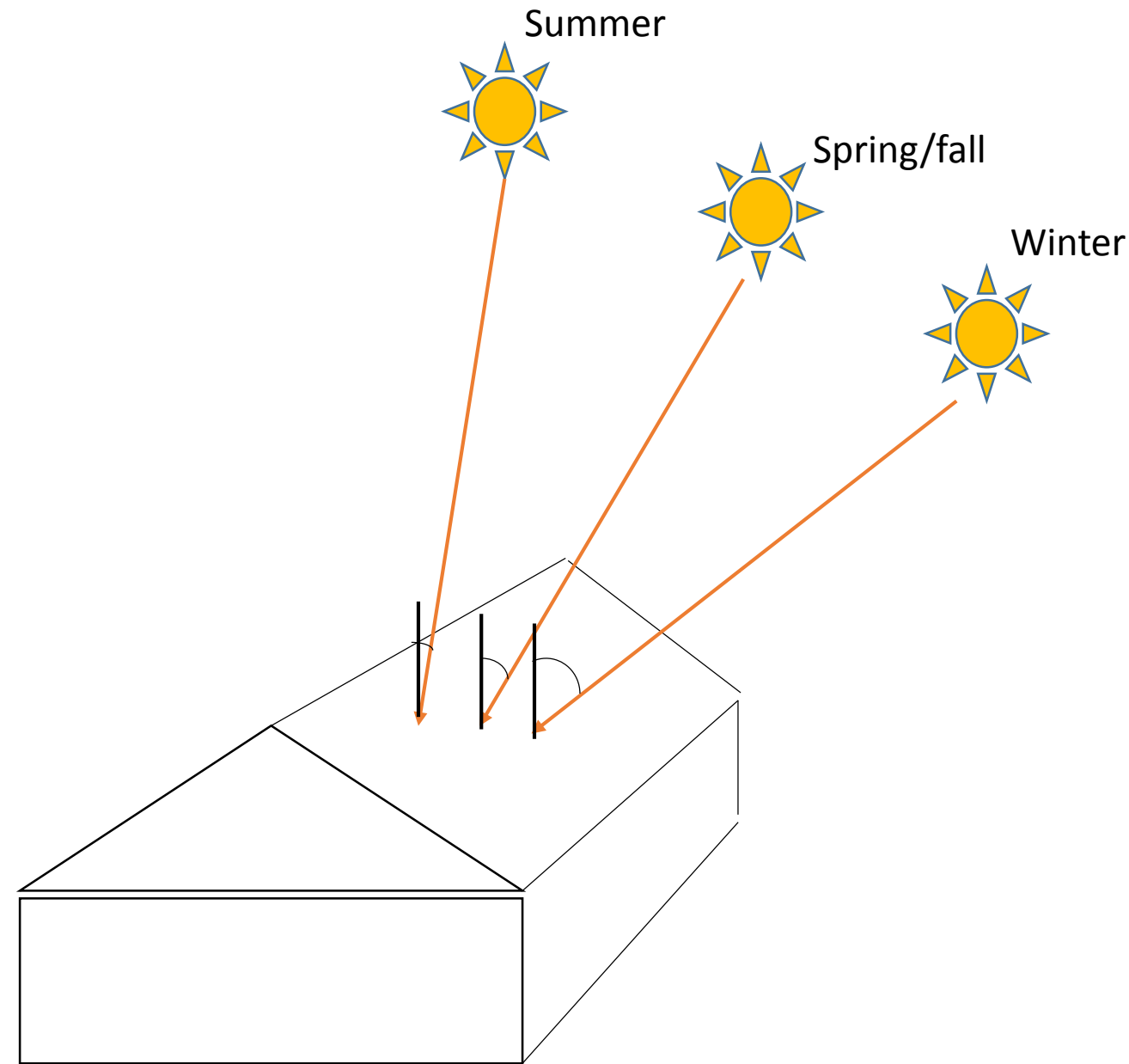
Location:

- **Space requirement:** What size will fit current needs and future expansion?
- **Soil:** Gentle slope good for drainage, rarely native soil is used as substrate
- **Shadows** minimum distance = $2.5 \times \text{height}$ to avoid shadows
- **Snow:** a 100 ft boundary for tree line to avoid snow drifts
- **Land-use:** zoning, tax laws, urban growth problems
- **Climate:** avoid low-light areas, high winds = higher heating costs; wind breaks
- **Labor Supply:** supply / demand dictates labor costs; healthy economy = higher wages
- **Accessibility:** shipping costs, utilities available, market?
- **Water** quantity (up to 30,000 gal/acre/day and quality are important

Orientation

Angle of incidence

- Greenhouse orientation is important for sunlight transmission into greenhouse and sunlight distribution inside the greenhouse
- Winter lighting is most important: less light and long shadows
- Angle of incidence is the angle between sunlight and imaginary line perpendicular to the surface
- Less angle of incidence is better

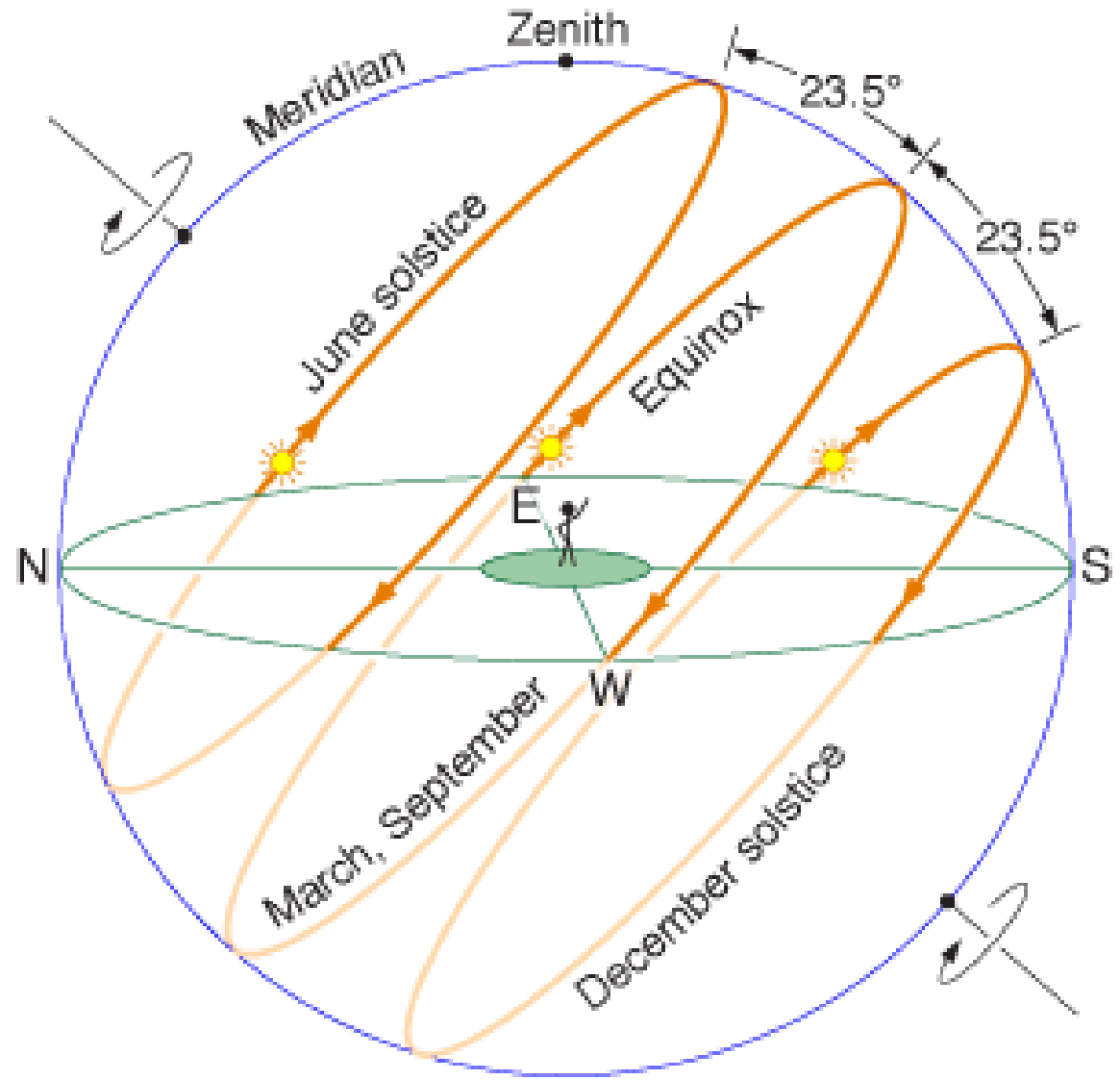


Orientation

Solar path

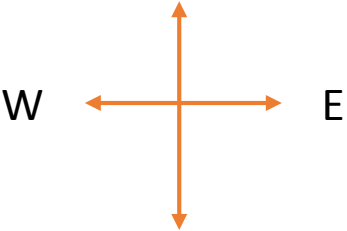
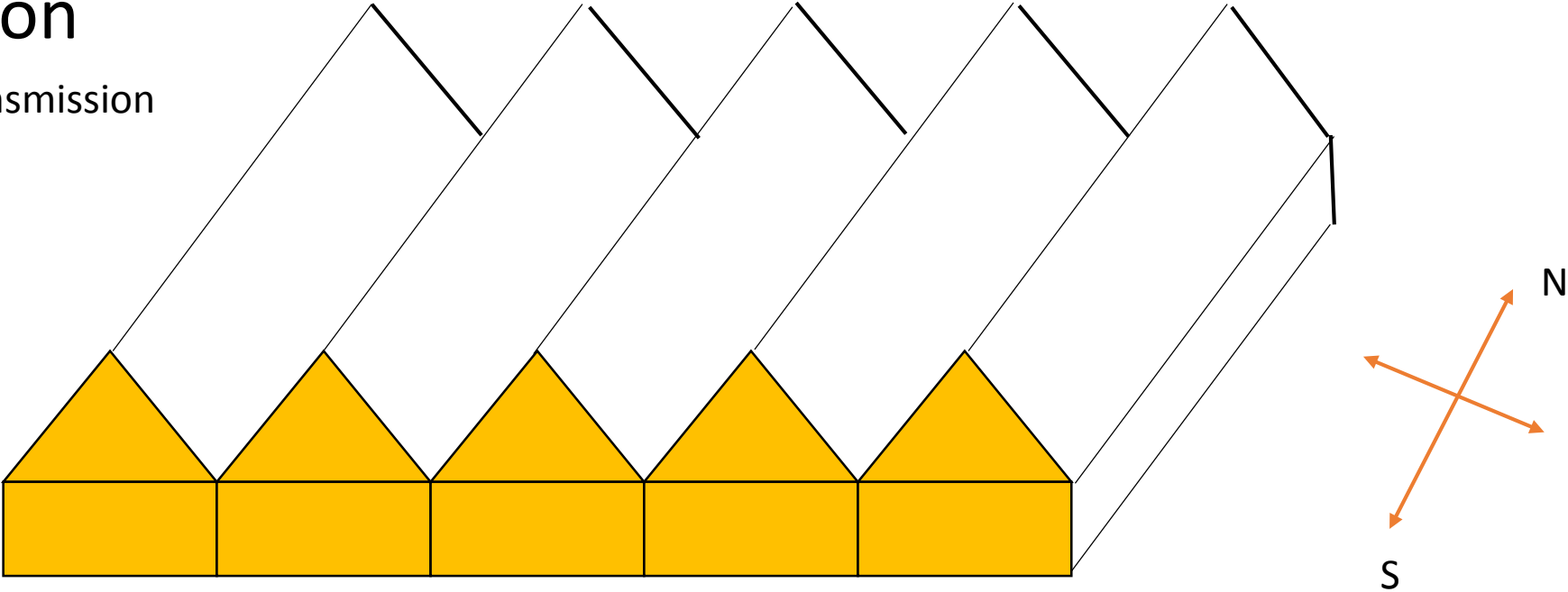
In winter sunlight is

- mostly on the southerly side
- angle of incidence is high
- low intense



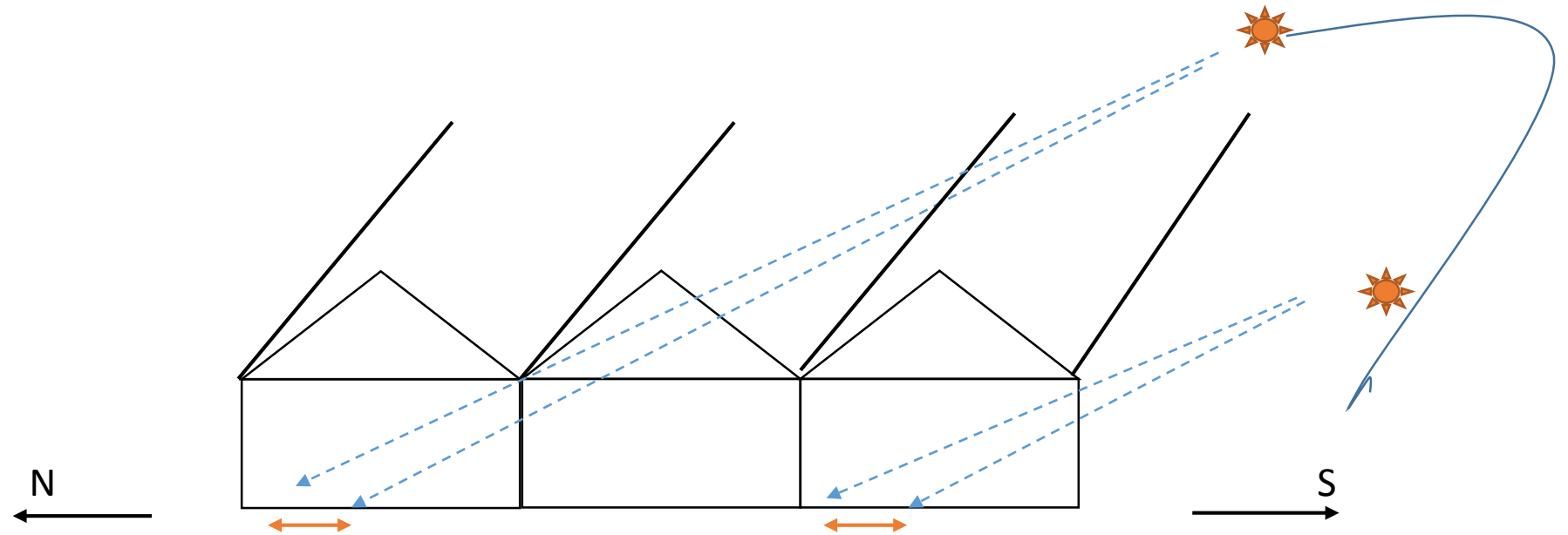
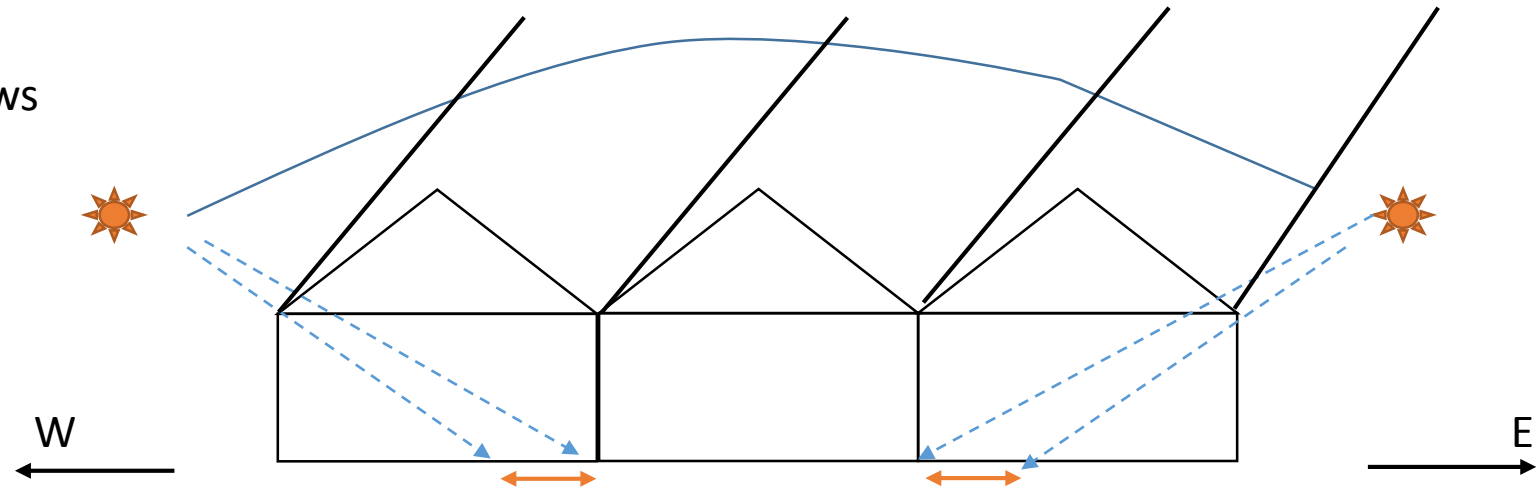
Orientation

Winter light transmission



Orientation

Winter light distribution/ shadows



Orientation

- Greenhouse orientation is important for sunlight transmission into greenhouse and sunlight distribution inside the greenhouse
- Winter lighting is most important: less light and long shadows
- More transmission if incidence angle is less, more uniform light distribution if shadows from structures move inside the greenhouse

Above 40 ° latitude:

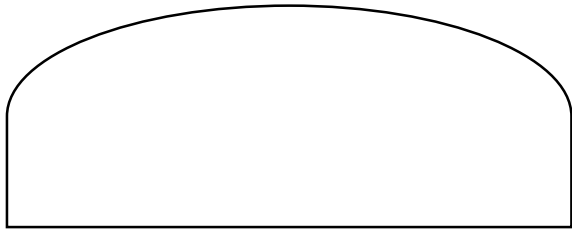
- run ridges of single-span greenhouses E-W for best light transmission
- run ridges of multi-span greenhouses N-S for best light distribution

Below 40 ° latitude:

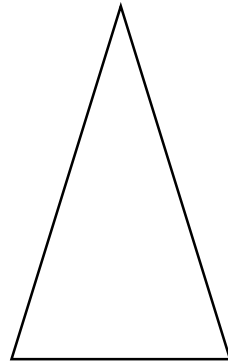
- run ridges of all houses N-S because better light distribution is more important than optimization of light transmission

Types of greenhouse structures

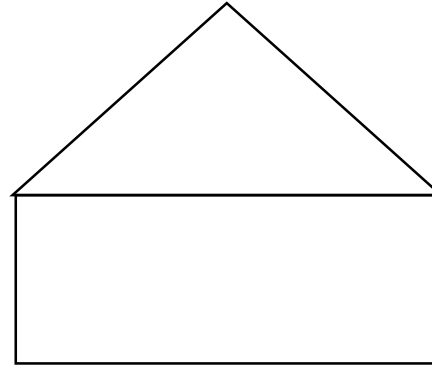
Single span



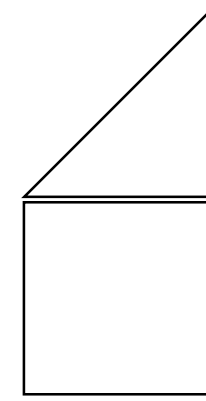
Quonset



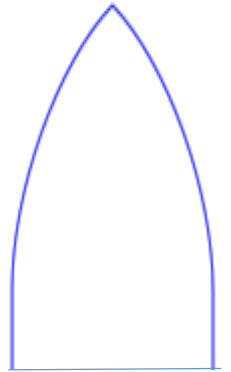
A frame



Gabled

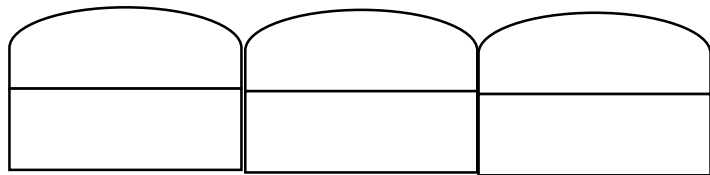


Lean to

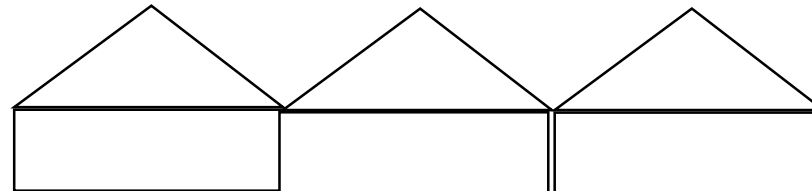


Gothic

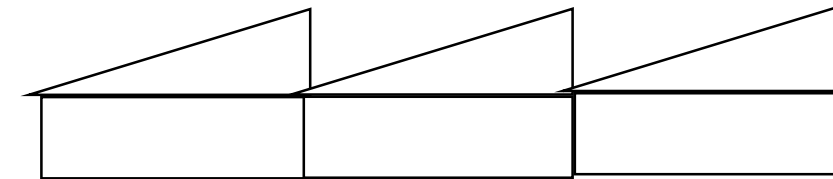
Multi span



Ridge and furrow



Venlo



Saw toothed

Greenhouse roofing materials

Characteristic	Glass	Polythylene	Poly carbonate	Fiberglass (FRP)
Light transmission	high	high	medium	high and uniform
Cost	high	cheap	medium	high
weight	heavy	light	light	light
Durability	~25 yrs	~ 2 to 5 yrs	~ 10 yrs	~15 yrs
Other	lot of structure	double layered for heat control, IR blocker, UV inhibitor _ antifog to be added, double layered for heat control	less flammable, treated for UV	collects dust and flammable

